SUPERIOR TECHNOLOGY.
STRONGER PROTECTION.
Botulism kills cattle

Botulism is a severe and often fatal disease of sheep and cattle. It is caused by a toxin produced by the bacterium Clostridium botulinum. This bacterium can survive in the environment for a long time as a resistant spore. Under favourable conditions the spore is activated, the bacterium multiplies and toxin is produced. Symptoms of botulism are caused when cattle accidentally ingest this lethal toxin.

How does botulism occur?
Cattle ingest preformed botulism toxin, which damages the junction between muscle and nerves. It is the most lethal toxin known.

The most common causes of botulism in cattle are associated with:
- **Bone or decaying carcass chewing** – In phosphorus deficient areas cattle will chew bones or carcasses to satisfy their need for protein or phosphorus.
- **Contaminated feed** – Bales can be contaminated by something like a small animal carcass, where the toxin then spreads.
- **Decaying feed** – Clostridium botulinum can grow in any decaying organic matter, not just animal carcasses.
- **Toxico-infectious botulism** – This rare occurrence is mediated by live bacteria entering a wound on the body.

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High risk (endemic) botulism areas

With around 70% of northern Australian soils being phosphorus deficient, botulism can be a significant productivity problem for producers running both extensive and intensive cattle enterprises. Outbreaks in areas of southern Australia (particularly in intensive beef and dairy enterprises) are usually due to the presence of dead vermin or wildlife in animal feed stuffs, grains, hay or water. These areas are typically known as non-endemic areas.

SingVac provided more protection to more cattle

In 2015, Virbac and the Northern Territory DPIF along with a team of private veterinarians conducted a botulism trial on over 450 animals across 15 northern Australian cattle stations, that had been vaccinated in the previous 12 months using SingVac® 1 Year, SingVac® 3 Year or Longrange.

Some 83% of animals vaccinated with SingVac were found to have adequate protection levels, with several stations achieving 100%.

Only 60% of the animals vaccinated with Longrange had adequate protection levels.

23% more animals protected

SingVac® Protects Cattle
Higher immunity = stronger botulism protection

On many properties across northern Australia cattle will regularly face exposure to different levels of botulism toxin. A vaccine aims to prevent disease from most levels of toxin exposure.

How do vaccines work?
When botulinum toxin enters the body, the immune response mounted is typically too slow to prevent disease and death. Vaccination allows for a quicker and greater immune response. Vaccines contain a part of the disease (antigen) that mimics the disease so that the body is able to mount an immune response without being directly exposed to the deadly disease. This immune response triggers cells within the system responsible for fighting disease. These cells deliver a message to the lymph nodes, where specialised ‘memory cells’ are created. These memory cells will remember the disease and trigger an immediate immune response, if and when the body faces another threat from botulism. These memory cells eventually die off, which is why most vaccines require booster shots given at a later date.

What is an adjuvant?
Adjuvants are chemicals that we add to assist the animal’s immune system in recognising the antigen (the component of the vaccine that mimics the disease).

How do adjuvants work?
Adjuvants cause inflammation at the site of injection, attracting immune cells to the vaccination site. Adjuvants then purposefully try to prolong the exposure to the antigen. The type of adjuvant used in a vaccine can completely change the type and level of immune response from the body, meaning that the adjuvant can have a significant effect on how protected you are from the disease.

Levels of immunity to botulism in individual animals will always differ significantly across the herd. Animals with higher levels of immunity will be able to survive higher levels of toxin challenge.

SingVac’s unique W/O/W technology
There are a number of different adjuvants currently in use in animal health vaccines, however SingVac is the only cattle vaccine in Australia to utilise a water in oil in water adjuvant. This unique formulation causes the animal’s body to mount a higher immune response against botulism, and to keep building the immune response to a superior level than other ‘traditional’ vaccines. Traditional vaccines contain the antigen suspended in an aluminium salt adjuvant, which delivers all the antigen to the body at the one time upon injection. SingVac has been specially formulated in three layers to create a stronger immune response, and keep cattle better protected for longer.

SingVac – the highest level of botulism immunity available
A higher titre response means that your cattle have higher levels of immunity and will be better equipped to fight off a botulism challenge.

Animals vaccinated with SingVac were found to have a much higher average titre response of 1.16 compared to Longrange, with an average of 0.67.1

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Average Titre Response</th>
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<tbody>
<tr>
<td>SingVac</td>
<td>1.16</td>
</tr>
<tr>
<td>Longrange</td>
<td>0.67</td>
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Stage 1: An immediate immune response
The water and antigen mix that surrounds the oil stimulates the animal’s immune system to mount an initial immune response.

Stage 2: A stronger immune response
Over time the water and antigen droplets trapped inside the oil are released. Every time this happens, the immune system triggers a new round of response to the botulism antigens. No other botulism vaccine on the market can perform this second stage. This is what makes SingVac a technically superior vaccine.
Not all vaccines offer the same level of protection

No matter what vaccine you use, you will never have complete protection against botulism for 100% of your cattle herd 100% of the time. This is due to a range of different factors that affect not only your cattle and how their immune system responds to the vaccine, but also how the vaccine is actually delivered to the animal.

North Australian Botulism Study – only 77% of cattle were protected

In the 2015 vaccination study conducted by the Northern Territory DPIF and Virbac, along with a team of private veterinarians testing 450 animals in northern Australia, it was discovered that only 77% of animals vaccinated in the previous 12 months against botulism had achieved effective levels of protection against botulism.

Trace minerals for stronger immunity

The process of vaccination significantly depletes the animal’s existing trace minerals. A rapidly absorbed top up of key trace minerals ensures the normal health and function of the immune system, which is essential for a vaccine to work.

Low immunity hinders productivity

The immune system is complex and needs good nutrition to function properly. Animals in poor condition or missing key nutrients will never respond as well to disease or vaccination. The immune system can also be hindered when animals undergo routine husbandry procedures and environmental stressors. These include marking, weaning, transport, drought and extreme heat. A weakened immune system leaves an animal susceptible to disease and failure to respond to a vaccine. This can lead to significant production losses.

Although it is not practical to avoid all husbandry procedures and environmental stressors, it is possible to help provide optimum nutrition to ensure that the animal’s immune system is working at full capacity. This will reduce the likelihood of disease, and the associated negative impacts on production.

How to build and maintain a healthy immune system

There are a number of essential nutrients required for building and maintaining a strong immune system.

These essentials include energy, protein and trace minerals, which are especially important around the time of vaccination to ensure a strong immune response. Key trace minerals important for the immune system of cattle include selenium, copper, zinc and manganese, all of which are found in Multimin. Because Multimin is absorbed into the blood in eight hours and the liver within 24 hours, it is able to rapidly enhance the immune system.

Numerous university and Australian trials have proven that cattle treated with Multimin, at the same time as vaccination (e.g. SingVac), produced a significantly stronger and faster vaccine response compared to animals not given Multimin. This means that Multimin helps cattle become better protected against disease. Multimin is the only trace mineral injection that is proven to improve response to vaccination.

Cattle given Multimin and SingVac concurrently had 23% higher protective levels against botulism, 42 days after vaccination, compared to cattle given SingVac alone.

Common causes of reduced vaccine effectiveness

<table>
<thead>
<tr>
<th>Poor Immune Response</th>
<th>Other Factors</th>
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<tr>
<td>Concurrent disease</td>
<td>Unvaccinated animals - missed musters</td>
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<tr>
<td>Stress - including transport, mustering, yarding, feeding, weaning, calving</td>
<td>Poor vaccination technique</td>
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<td>Parasite burdens</td>
<td>Poor vaccine handling</td>
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<tr>
<td>Nutritional problems - Inadequate energy, protein, vitamins, and imbalanced trace minerals</td>
<td>Vaccine choice</td>
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Nutritional factors and proper vaccine handling are important to improve vaccine effectiveness. To improve the level of protection of your herd use SingVac.

No matter what your program, SingVac is the ideal choice

☐ Choose SingVac for its superior water in oil in water technology
☐ Choose SingVac 1 year for your annual vaccination program to achieve the highest levels of immunity for your cattle
☐ Choose SingVac 3 year to increase flexibility with a convenient and unique three-year program.
SingVac 3 Year Single Shot Botulinum Vaccine

SingVac 3 Year Single Shot Vaccine for Cattle is the only single dose botulinum vaccine in the world that provides three years of protection against botulism. SingVac 3 Year Vaccine provides protection against two botulinum toxins that cause botulism in cattle, types C and D. SingVac 3 Year Vaccine has nil meat and milk withholds and a nil export slaughter interval (ESI). This ensures there is no restriction on the slaughter, sale or export of cattle when using SingVac 3 Year Vaccine.

- 36 months of protection from a single dose
- Safe in young calves, pregnant cows and breeding bulls
- Nil meat WHP, milk WHP, ESI
- 2 mL dose volume

SingVac 1 Year Single Shot Botulinum Vaccine

SingVac 1 Year Single Shot Bivalent Botulinum Vaccine for Cattle is a single dose botulinum vaccine that provides annual protection against botulism. SingVac 1 Year Vaccine provides protection against two botulinum toxins that cause botulism in cattle, types C and D. SingVac 1 Year Vaccine has nil meat and milk withholds and a nil export slaughter interval (ESI). This ensures there is no restriction on the slaughter, sale or export of cattle when using SingVac 1 Year Vaccine.

- 12 months of protection from a single dose
- Safe in young calves, pregnant cows and breeding bulls
- Nil meat WHP, milk WHP, ESI
- 2 mL dose volume

Multimin Injection for Cattle

During high demand periods like calving or joining, or at stressful events like marking or mustering, your cattle need more. Multimin is a fast acting trace mineral injection that gets your cattle performance ready. Multimin, when used with a vaccination, has been proven to increase the immune response in the animal meaning that your cattle are better protected against botulism.

- Zinc 40 mg/mL
- Copper 15 mg/mL
- Nil withholding & ESI
- Manganese 10 mg/mL
- Selenium 5 mg/mL
- Nine month broached vial claim

3. Virbac Trial 372. 11 Vaccine Productivity and immunity 2016